Physical Science
1st Semester

Name KEY
Date _____ Pd ____

1st Semester Exam Review Packet 2013

To help you study and prepare for the exam, fill out and study this guide. ALSO, please go back and review ALL your notes, tests, quizzes and lab activities.

Terms you should know and understand: Be able to define the following terms and whenever possible be able to give examples of how each term is used in physics and/or the real world.

Define the following terms dealing with motion

a. Frame of reference
AN OBSERVERS PERSPECTIVE WHICH AFFECTS THEIR INTERPERTATION OF AN OBJECTS MOTION (OR LACK OF MOTION)

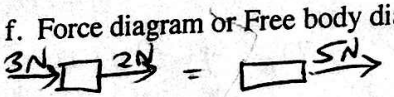
b. Force
A PUSH OR PULL ON AN OBJECT

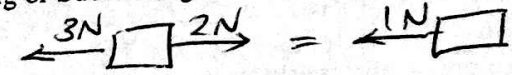
c. Balanced Force
FORCES THAT ARE EQUAL IN MAGNITUDE AND OPPOSITE IN DIRECTION

d. Unbalanced Force
FORCES THAT ARE UNEQUAL IN MAGNITUDE AND OPPOSITE IN DIRECTION

e. Net Force
THE SUM OF THE FORCES (TOTAL OF THE FORCES)

f. Force diagram or Free body diagram/Adding or Subtracting forces





g. Speed
THE DISTANCE COVERED BY AN OBJECT OVER A PERIOD OF TIME - HAS NO DIRECTION

h. Average Speed
THE TOTAL DISTANCE COVERED BY AN OBJECT OVER THE TOTAL TIME

i. Constant Speed
THE SPEED AN OBJECT WOULD NEED TO GO FROM POINT TO POINT IN A GIVEN TIME WITHOUT SPEEDING UP, SLOWING DOWN OR CHANGING DIRECTION.

j. Velocity
THE DISPLACEMENT OF AN OBJECT OVER A PERIOD OF TIME - HAS A DIRECTION

k. Acceleration
THE RATE AT WHICH AN OBJECT CHANGES ITS VELOCITY, SPEEDING UP, SLOWING DOWN OR CHANGING DIRECTION

l. Friction
A FORCE OPPOSING MOTION

m. Inertia (AN OBJECTS "LAZINESS") AN OBJECTS RESISTANCE TO CHANGE IN MOTION! THE MORE MASSIVE AN OBJECT IS THE MORE INERTIA IT HAS

n. Weight compared to Mass
WEIGHT = GRAVITATIONAL FORCE = MASS x GRAVITY (DEPENDS ON LOCATION'S GRAVITY) EARTH VS MOON
MASS = HOW MUCH MATTER AN OBJECT IS MADE OF (DOESN'T CHANGE DEPENDING ON LOCATION)

o. Gravity
A FORCE ATTRACTING ONE BODY TO ANOTHER
THE ACCELERATION OF GRAVITY ON EARTH IS 9.8 M/S²

p. Newton
THE UNIT OF FORCE N $\left(F = M \cdot a;\ N = \frac{kg \cdot m}{s^2}\right)$

q. Joule
THE UNIT OF ENERGY J $\left(\begin{matrix} KE = \frac{1}{2} M \cdot V^2 \\ PE = m \cdot g \cdot h \end{matrix};\ J = \frac{kg \cdot M^2}{s2}\right)$

r. Kinetic energy
MOVING ENERGY
$KE = \frac{1}{2} mv^2$
INCREASES EXPONENTIALLY IF VELOCITY INCREASES, INCREASES PROPORTIONALLY IF MASS INCREASES

s. Gravitational Potential energy
ENERGY OF POSITION INCREASES PROPORTIONALLY IF MASS OR HEIGHT INCREASE
GPE = PE = m·g·h

t. Law of Conservation of Energy
ENERGY CANNOT BE CREATED OR DESTROYED IT CAN ONLY CHANGE FORMS

1. Sketch the Electromagnetic spectrum labeling the different types of waves. (Include visible light and all its individual colors) Label on your drawing where energy, and frequency are highest. Also label where the wavelengths are the longest.

LONG WAVELENGTH
LOW FREQUENCY
LOW ENERGY

SHORT WAVELENGTH
HIGH FREQUENCY
HIGH ENERGY

RADIO MICRO INFRARED VISIBLE U.V. X-RAY GAMMA

ROY G BIV

2. Define and give an example of:

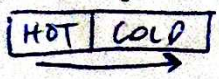
thermal energy (HEAT ENERGY) THE TOTAL KINETIC ENERGY DUE TO THE MOTION OF PARTICLES IN AN OBJECT

temperature THE AVERAGE KINETIC ENERGY OF PARTICLES IN AN OBJECT

heat transfer
→ WHEN KINETIC ENERGY IS TRANSFERRED FROM ONE OBJECT TO ANOTHER
→ ALWAYS MOVES FROM WARM TO COLD

3. Draw, explain and give examples of each of the following thermal energy transfers:

Conduction



OBJECTS THAT ARE IN DIRECT CONTACT TRANSFER ENERGY. THE PARTICLES IN THE WARMER OBJECT VIBRATE PARTICLES IN COOLER OBJECT THAT ITS TOUCHING

Convection (density's role)

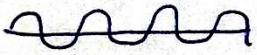
HOT ↑ COLD

HEAT TRANSFER IN FLUIDS DUE TO CHANGES IN DENSITY. A COOL FLUID TAKES UP LESS SPACE AND IS MORE DENSE. A HOT FLUID IS LESS DENSE AND TAKES UP MORE SPACE SO THE HOT FLUID RISES TO THE TOP

Radiation

THE ENERGY IN ELECTROMAGNETIC WAVES - CAUSE AN INCREASE IN THERMAL ENERGY - DO NOT REQURE CONTACT OR MEDIUM FOR TRANSFER

4. Compare and contrast a transverse wave to a compressional/ longitudinal wave:

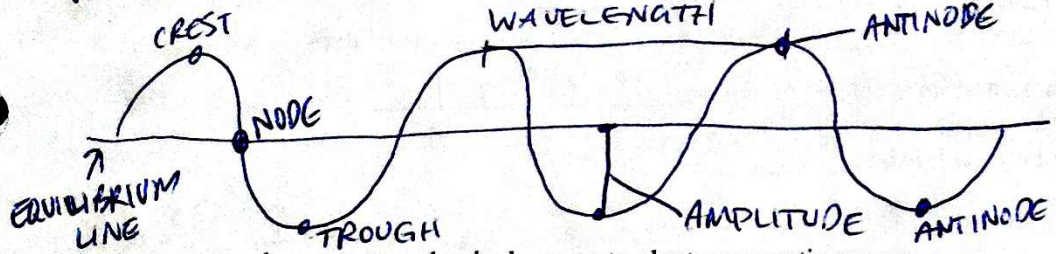


TRANSVERSE: PULSE MOVES PERPENDICULAR TO DISTURBANCE

LONGITUDINAL: PULSE MOVES PARALLEL TO DISTURBANCE

5. Draw a standing wave and label and explain the following; Crest, Trough. Wavelength. Amplitude, Frequency, equilibium or rest position.

TIME = 1 SECOND →



FREQUENCY = # WAVELENGTHS / TIME (S)

3 WAVELENGTHS / 1 SEC = 3 Hz

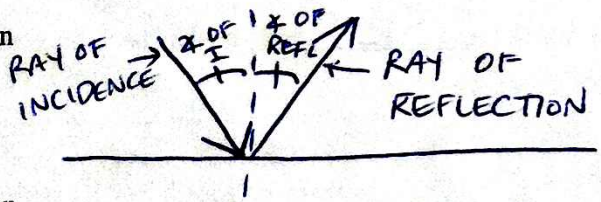
6. Compare and contrast mechanical waves to electromagnetic waves.

MECHANICAL → NEED A MEDIUM TO TRAVEL (OCEAN, SLINKY, STADIUM) MOVES FASTER THROUGH DENSER MEDIUM

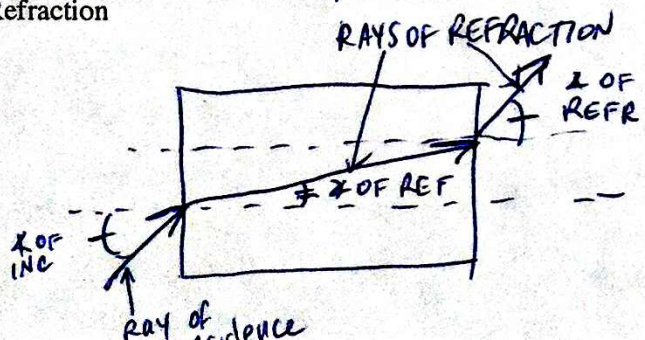
E.M. → NEED NO MEDIUM TO TRAVEL - LIGHT ENERGY - MOVES AT THE SPEED OF LIGHT - SLOWS WHEN ENTERING DENSER MEDIUM

7. Draw, explain and give an example of the ways waves interact:

Reflection



Refraction



Testing Your Knowledge and Terminology: Use scientific terms to fill in the blanks below.

8. Objects at rest will remain at REST, and objects in motion (in a STRAIGHT line at a constant SPEED) tend to remain in MOTION unless acted upon by an UNBALANCED force.

This statement is also known as Newton's 1ST law of motion.

9. If an object is speeding up, slowing down or changing direction the object is ACCELERATING

10. INERTIA is the natural tendency of an object to remain at rest or to remain moving with constant speed.

11. Velocity is speed in a given DIRECTION

12. A FORCE is a push or pull.

13. If you have an unbalanced force on an object, the object will ACCELERATE.

14. Force is measured in ~~JOULES (J)~~ NEWTONS (N)

15. The formula for force is $F = M \cdot a$.

16. Weight is a product of its mass and its acceleration due to GRAVITY

17. Acceleration due to gravity here on Earth is 9.8 (10) m/s^2.

18. If a force remains constant and the mass of the object is increased, according to Newton's 2ND law of motion, the acceleration of the object will DECREASE.

19. If the mass of an object remains constant and the force applied to the object is increased, the acceleration of the object will INCREASE.

20. According to Newton's 3rd law of motion, forces always occur in PAIRS. For every applied force their is an EQUAL and OPPOSITE force.

21. When you push down on a step to go up the stairs, the STEP pushes back on you.

Formulas, Equations, and Other Fun Things To Know & Practice

If you would like this worksheet to help you study for the exam, be sure to write out the formulas, show all your work, and LABEL your answers. Answers only will not be of much help when trying to look for how to solve a problem.

* DIRECTIONS WERE NOT SPECIFIC.... LOOKING FOR ⊛ ANSWERS!

Distance	Time
10 meters	2.03 sec
20 meters	3.89 sec
30 meters	5.19 sec

IF YOU CONSIDERED THE GIVEN TIMES THE SPLIT TIMES YOU GOT:

0-10	4.93 m/s
10-20	2.57 m/s
20-30	1.93 m/s

0 - 10 M

Use the above information to calculate and answer questions 22-24:

22. What is the split time for each interval & what is the average speed for the interval.

SPLIT TIME

2.03 s

3.89 - 2.03 = 1.86 s

5.19 - 3.89 = 1.3 s

Interval (Split)	Average Speed (m/s)
0-10 meters	$s = \frac{d}{t} = \frac{10\,M}{2.03} = 4.93\,M/s$
10-20 meters	$\frac{10}{1.8} = 5.38\,M/s$
20- 30 meters	$\frac{10}{1.3} = 7.69\,M/s$

⊛ 23. What interval has the fastest speed? 20-30 M

24. What is the object's average speed for the entire distance? Show your work.

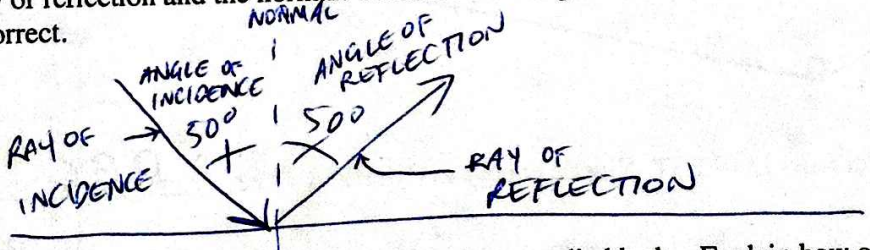
⊛ $s = \frac{d}{t} = \frac{30\,m}{5.19\,s} = 5.78\,\frac{M}{s}$

$\frac{30\,M}{11.11\,S} = 2.7\,\frac{M}{S}$

25. If the frequency of a wavelength is 32 hertz, the wavelength is 10 meters and the amplitude is 5 meters, what is the speed of the wave? Show all your work and label your units.

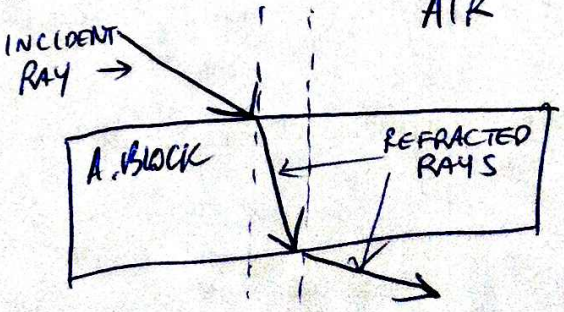
$V = \lambda \cdot f = 10\,m\,(32\,Hz) = 320\,M/S$

26. Draw a plane mirror and show correctly how a laser or ray is reflected off the mirror. Label the ray of incidence ray of reflection and the normal. Measure both angle of incidence and reflection to prove that your drawing is correct.



27. Show how a laser or ray can be refracted through an acrylic block. Explain how one knows if the light is speeding up or slowing down through a medium?

WHEN A RAY BENDS TOWARDS THE NORMAL IT IS SLOWING DOWN - WHEN IT BENDS AWAY FROM THE NORMAL IT'S SPEEDING UP



28. What are some factors that determine the speed of a wave through a medium? Be specific.

DENSITY

OPACITY / TRANSPARENCY

29. Take two identical objects that look like rocks. One is a real rock that has a very large mass and the other is a styrofoam rock that has a very small mass:

Which one will fall faster? THE REAL ROCK (DUE TO SURFACE AREA) AIR RESISTANCE

Which one will accelerate faster if pushed with an equal amount of force across the room?
THE STYROFOAM ROCK

Which one will weigh more?
THE REAL ROCK

Which one has more inertia?
THE REAL ROCK

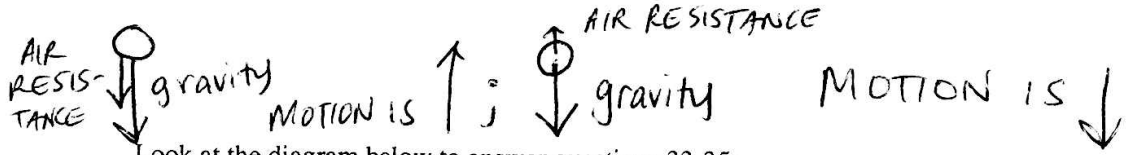
30. If a football player has a mass of 123 kg and net force of 861 Newton's, what is his acceleration?

$$A = \frac{F}{m} = \frac{861\ N}{123\ kg} = 7\ \frac{m}{s^2}$$

31. If a car can go from 0 m/s to 60m/s in 30 seconds, what is it's rate of acceleration?

$$A = \frac{\Delta V}{\Delta t} = \frac{60\ m/s}{30\ s} = 2\ m/s^2$$

32. Draw a force diagram of an object that was tossed into the air.



Look at the diagram below to answer questions 33-35:

33. Place the letters in order from LOWEST Kinetic energy to HIGHEST K.E. A D B C

34. If the ball has a mass of 22kg and it is at a height of 12 meters at letter A, what is its G.P.E.? Show work below.

$PE = m \cdot g \cdot h \quad 22\ kg \cdot 9.8\ m/s^2 \cdot 12\ m = 2587.2\ J$

35. What is the total energy at position A? 2587.2 J

36. Look at the following diagram and explain what will happen to the ball on the right side if there is **NO friction.**

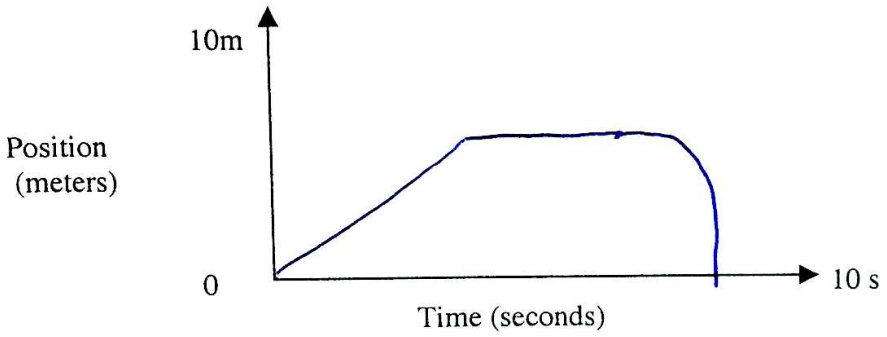
Explain below:

THE BALL WILL ROLL UNTIL IT REACHES THE SAME HEIGHT ON THE OPPOSITE SIDE DUE TO CONSERVATION OF ENERGY (GPE TO KE BACK TO GPE)

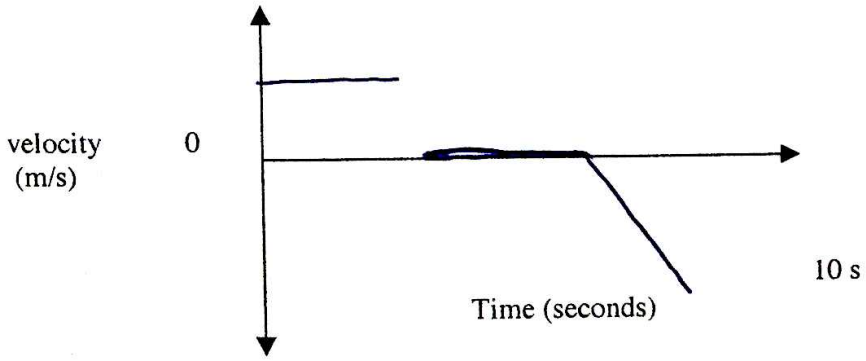
37. Look at the above picture. What would happen if there were friction. Explain.

IF FRICTION IS PRESENT SOME ENERGY WILL BE TRANSFORMED INTO HEAT AND THE BALL WILL REACH A LOWER HEIGHT ON THE OPPOSITE SIDE - THIS WILL HAPPEN UNTIL THE BALL STOPS

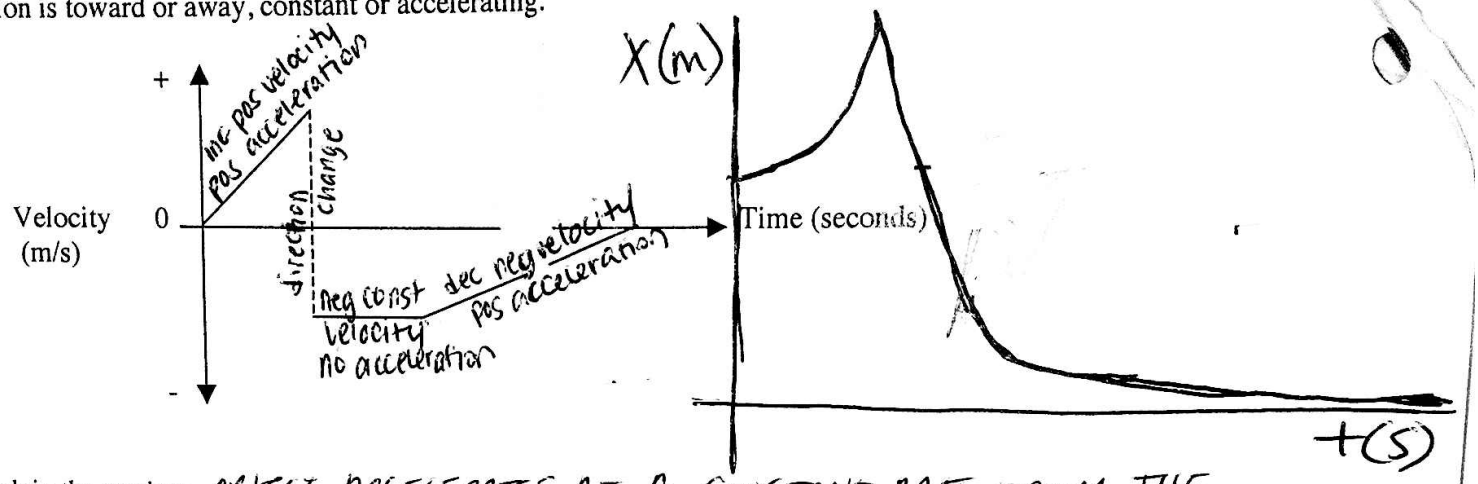
38. Draw a position-time graph that shows an object moving at a fast constant speed away from the origin, stopping for a few seconds then accelerating toward the orgin (slow to fast).



39. Draw the same situation in #38 on a velocity-time graph.



40. Look at the velocity-time graph below and write out the motion of the object. Be sure to explain if the motion is toward or away, constant or accelerating.



Explain the motion: OBJECT ACCELERATES AT A CONSTANT RATE FROM THE ORIGIN. IT TURNS AROUND AND MOVES AT A CONSTANT VELOCITY, FINALLY IT ACCELERATES AT A CONSTANT RATE BACK TO THE ORIGIN

41. State and give an example of Newton's 1st Law of motion.

AN OBJECT IN MOTION STAYS IN MOTION ~~OR~~ UNLESS ACTED UPON BY A NET FORCE. AN OBJECT AT REST STAYS AT REST UNLESS ACTED UPON BY A NET FORCE.

EX. A PIECE OF PAPER WILL STAY AT REST ON A TABLE FOREVER UNLESS A FORCE ACTS ON IT

42. State and give an example of Newton's 2nd Law of motion.

THE ACCELERATION OF AN OBJECT IS DIRECTLY RELATED TO THE FORCE EXERTED ON THE OBJECT AND INDIRECTLY RELATED TO ITS MASS. $F=m\cdot a$; $a=F/m$

EX. THE SAME FORCE ACCELERATES A SMALL MASS MORE THAN A LARGE MASS

43. State and give an example of Newton's 3rd Law of motion.

FOR EVERY ACTION THERE'S AN EQUAL AND OPPOSITE REACTION. (FORCES ALWAYS COME IN PAIRS)